

lowed by E. Lamy,¹ but without indicating what group of arks it was thought to pertain to.

Rafinesque's four species were not defined, so that *Cyphoxis* has to be treated as a genus without species. There is no fossil ark of the region covered by Rafinesque which meets the requirements of the diagnosis, but it applies in every respect to the casts of *Cucullaea* of the subgenus *Idonearca* Conrad, found abundantly in the Cretaceous marls of New Jersey. At the time Rafinesque wrote, none of the species had been described; but some years later S. G. Morton described *Cucullaea vulgaris* and *C. antrosa*.² The first of these *C. vulgaris* Morton, is now designated type of *Cyphoxis*. If a name based upon a cast is acceptable, *Cyphoxis* will replace *Idonearca* Conrad.

Rafinesque probably picked up these casts, which are common objects in the marl pits, in the course of his rambles in search of plants and shells while he was living in Philadelphia. He appears to have been the first naturalist to notice any Cretaceous shell in the New Jersey marls. The characteristically careless omission of the locality of his fossils caused the find to be overlooked by Morton, Conrad and others who worked on the fauna later.

THE NOMENCLATURE OF ECOLOGICAL VARIETIES

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Mr. Frank Collins Baker, in his introduction to Part I of his "Fresh Water Mollusca of Wisconsin", takes issue with those—specified by him as geneticists—who question the power of environment to determine the evolution of species. He says ". . . field zoologists who have observed the multitude of living things in their diverse environ-

¹ Journ. de Conchyl., vol. 55, 1907, p. 1.

² Synopsis of the Organic Remains of the Cretaceous Group of the United States, 1834, pp. 64, 65. Good figures have been given by Whitfield, Brachiopoda and Lamellibranchiata of the Raritan Clays and Greensand Marls of New Jersey, pl. 13. 1886.

ments cannot but believe that the environment has played a large part in the production of this infinite variety of living organisms. The geneticists who confine their studies to laboratory experiments on a few animals, usually under abnormal conditions, are not in as good position to judge of the effect of environmental changes as are the students who have spent years in field observations."

Mr. Baker himself has supplied in another place the most telling kind of demonstration of the domination that environment has over the forms of the shells of freshwater mollusca.¹ This came of a study that he made in Barron County, Wis., in 1921. About sixty years ago a dam was built for lumbering purposes in the region which impounded parts of the waters of three large creeks. A series of artificial lakes was created, one of them as large as seven miles long and a mile wide. Six species and varieties of mollusks were found in 1921 to be modified by the alterations in the character of habitat. The creek *Anodonta grandis plana* Lea was supplanted by the relatively shorter and wider *A. grandis footiana* Lea. The compressed and high lake form of *Lampsilis siliquoidea* Barnes that approaches the variety *rosacea* succeeded the elongated and cylindrical river form. Most of the specimens of *Amnicola limosa* Say that Mr. Baker collected in the lakes were the variety *porata*, a more globose shell than the stream form. Similar changes were wrought in the shape of *Lymnaea catascopium* Say. *Planorbis antrosus* Conrad apparently reverted in the lakes from the creek form called *P. antrosus unicarinata* Hald. to the typical specific characters. In the streams of the county, *Planorbis trivolvis* Say was typical; in the sixty-year old ponds it was of greater axial height and the whorls were more rounded. In addition to the forms recited, *Planorbis campanulatus wisconsinensis* Winslow, unknown in the creeks, has made its appearance in the waters above the dam.

¹ "Influence of a changed Environment in the Formation of New Species and Varieties," F. C. Baker, Ecology, IX, July, 1928, pp. 271-283.

Three similar instances that have come to my knowledge may be mentioned. Mr. William J. Clench collected *Goniabasis carinifera* Lam. in the Country Club Lake near Dalton, Ga., that was larger than any taken in the streams of the vicinity and I suspect a good deal larger than any specimens in the average museum collections. The lake is artificial. Mr. Herbert H. Smith was so fortunate as to be present when one of the locks of the Black Warrior River was emptied for repairs and he there came upon Naiades excessively large and freer than usual of the common erosion. In the natural pool below Crawfish Springs at Chickamauga, Ga., is a very slender, scarcely carinated form of *Pleurocera planogyrum* (Anth.). In the comparatively new pond just below the pool, *planogyrum* is heavier, longer, wider and exceedingly carinate.

Planorbis magnificus Pilsbry, too, would appear to have acquired its surprising development under conditions brought about by man.

Now all this, it seems to me, has a significant bearing on molluscan nomenclature. A scientific name tends to have the authority of a pronouncement from the bench. We think of it as setting metes and bounds as definite as a title deed. We are trained that way and, indeed, names thus conferred would be worthless the moment they were published if our respect was not enlisted on their side at their very beginning. Taxonomy is a mere amorphous mass if its nomenclatorial skeleton cannot hold it up. The demonstration that species may be modified in a relatively short time by an alteration in the environment is a demonstration also that freshwater forms lack the permanence that is implied by the erection of subspecific names. Surely a species or a subspecies ought to be conceived as much too fixed a thing to change, short of a great many generations, simply by reason of the establishment of a log dam across a creek or by an invasion on the part of organisms from a wave-swept area into a protected bay just around the corner. If I have counted them correctly, there are thirteen new subspecific names for freshwater gastropods in Mr.

Baker's latest work, his new specific names being ignored. In making these additions, Mr. Baker, one is compelled to believe, has failed to read the illuminating lessons of his own discoveries.

It may almost be said that for life in a freshwater stream nothing is fixed and certain, and not greatly more so for the life of a freshwater lake—contrasting with the commoner conditions of the sea as, say, a mountain torrent with a mill pond. Depths vary. The force of currents varies. The density of water varies between such extremes as do not fall to the experience of the marine forms of an average locality. Floods, laden heavily with silt, may be followed in a few weeks by droughts during which the temperature rises greatly and micro-organisms, benign or evil, multiply enormously. Where a gravel bar has given opportunity for gravel-inhabiting mollusks to flourish for a few seasons may appear a mud bank or a sand bar or a huddle of grinding boulders. Slack water may be the successor of swift water and frequently the clean, open bed of a stream becomes an ox-bow, left to one side to be choked with rotting vegetation. The variation of the hydrogen ion concentration of a body of water, as we are coming to know, can spell the difference between livable conditions and death,² and nowhere is this variation so much as in a creek or a river. The battle for existence is less strenuous in the lakes than in the streams, but it is present there also. In the lifetime of people now living in Michigan, many lakes of the state have been conquered by sphagnum and *Decodon*, and during that invasion the mollusks have succumbed. The reaction to variation in the habitat has been variation in the forms of life. Only in shallow bays, brackish sea marshes and the mouths of streams are there sets of marine conditions paralleling those of inland waters, and it is of interest to note in this connection that here the marine forms of mollusks display confusing variation. I am informed that in such situations there occur wide variations among the fishes.

² See "Life in Inland Waters", Kathleen E. Carpenter, 1928, p. 68.

Probably one reason for the present nomenclatorial Babel is that our illustrious predecessors approached the study of freshwater forms from the sea, which is to say that they were familiar first with the inhabitants of salt water and carried a habit of mind, brought about by earlier discoveries, over into their new labors. This antecedent has had a possibly unperceived influence upon us, such an influence as a solemn judiciary decision of the last generation has upon the interpretation of human law today. The result is a custom of considering a freshwater form that varies slightly from some previously known form as of far more importance than it actually is, of blinding us to the fact that plasticity is the inevitable concomitant of a varying habitat and, in the endeavor to point out in freshwater shells such border lines as may be defined among the marines, writing descriptions that are scarcely more than vague and misleading words.

Mr. Baker's findings in Wisconsin have served to crystallize in me a conviction that just as students of the mollusca were once too prone to multiply species they are too ready at this time to heap up subspecies and varieties. It is impossible to give an air of fixity to something that is not fixed in nature, however industriously and ingeniously we attempt it. The enterprise, indeed, can take on the mien of an intentional absurdity. Consider, for example, the instance of differentiating two river mussels by subspecific designation because one of them, from headwaters to the middle reaches of a stream, has a calculated obesity of 47 per cent or less and the other, occurring farther down, has an obesity in excess of 47 per cent. Is a man with a waist line of forty-eight inches any less a member of his species than a man whose midriff measures forty-two inches?

See "Variations in Fresh-Water Mussels", G. H. Ball, *Ecology*, III, 1922, p. 93.